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Logistic Regression Analysis of Diabetes Mellitus Patients Using Clinical Diagnosis in Debre Berhan Referral Hospital, Debre Berhan, Ethiopia

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Abstract: *Diabetes mellitus (DM) is a metabolic disorder where by glucose cannot effectively get transported out of the blood. It is a chronic disease with a high prevalence and a growing concern in worldwide. There are two Types of diabetes, which are Type I and Type II. A longitudinal data analysis retrospective based study was conducted between 1 st September, 2012 to 30 th August 2015 in Debre Berhan referral hospital.The main objective of the study was to analysis of progression of Diabetes Mellitus patients using fasting blood sugar level count following insulin, metformin and to identify factors predicting the progression of diabetic infection using logistic regression.*

Methods: A total of 248 DM patients were included in the study whom 111(44 .8%) were females and the rest 137(55 .8%) were males. Longitudinal data for a period of three years individuals would be extracted from the patient's records which contain epidemiological, laboratory and clinical information of all diabetic patients under insulin and metformin follow-up. The Logistic Regression analysis model incorporated by using SPSS and R Studio and the results were produced in this article for the progression of diabetic infection.

Results: Among the involved seven variables only the variable Bmi show a significant difference and this variable influence the DM patients on their diagnosis status. By using R square analysis it was observes that it will lie between 63.6% and 87.1% of the variation in decisions can be explained by the model in Block1

Conclusions: The study shows a high prevalence of Diagnosis due to Body mass index. With respect age both extremes are more respondents. In other studies the history of disease and diets(Fasting system) also interest on diagnosis of DM patients. To reduce the patients and increase their quality of life to prolong their living time

Key words: *Diabetics, Diabetes Mellitus, Clinical diagnosis of insulin, Referral Hospital, Logistic regression*

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I. Introduction:

Diabetes mellitus (DM) is a metabolic disorder where by glucose cannot effectively get transported out of the blood. The hormone insulin facilitates glucose from the blood and into tissues, decreasing blood sugar concentration. In diabetics, insulin is not produced either in adequate amounts or the body cannot effectively respond to insulin produced, chronically high blood glucose concentration can cause damage to capillaries, inhibiting the efficiency of blood circulation. This can lead to severe ailments such as kidney disease, limb amputations, glaucoma and bacterial infection [7]. It is also a group of metabolic disorders characterized by hyperglycaemi. Diabetes mellitus is a catabolic multisystem disease with both biochemical and anatomical consequences. It is a chronic disease of carbohydrate, fat and protein metabolism caused by either absolute lack of insulin or insulin resistance or secretors defects. Diabetes mellitus may present with characteristic symptoms such as thirst, polyuria, blurring of vision and weight loss according to [1]. According to International Diabetes Federation, 2011 reports of, the number of adults living with diabetes in Ethiopia was 3.5% [10]. Even though the national prevalence of diabetes in Ethiopia is estimated to be 2%, evidence suggests that its prevalence could be more than 5% in those older than 40 years of age in some setting [10]. A study by Watkins and Alemu conducted in Gondar found out most of the rural patients 77%) had Type I diabetes whereas in urban areas only 29% had Type I and 71% of them Type II diabetes [8]. Generally, the global burden of Diabetes mellitus has been increasing radically. The impact is high especially in developing countries in which resource is limited to identify the problem and develop need based clinical and community intervention [2]. Therefore, the objective of this study was to test statistical modelling in longitudinal analysis and identifies associated factors of fasting blood sugar level count of diabetic patients among outpatients of Debre Berhan

referral hospital [6]. Fasting Blood Glucose assessment is a tool used to help diagnose diabetes where glucose concentration is measured using venous or capillary blood. After a period of fasting, a healthy individual would exhibit a glucose [5] concentration, between 70-100mg/dl. However, even after a period of fasting, a diabetic would exhibit an abnormally high concentration of glucose in the blood, (126 + mg/dl) providing evidence for diabetes [4]. To study the progression of fasting blood glucose level in diabetic patients, fasting blood glucose level should be measured repeatedly per individual what is called longitudinal data, since the measurements are correlated within individuals, the classical regression techniques couldn't use rather the most flexible and powerful models were employed to handle such types of data [9]. The main aim of data analysis using the linear mixed model is to define an adequate error covariance structure in order to obtain efficient estimates of the regression parameters. The statistical software now includes the covariance structure as part of the statistical model and thus the covariance matrix can be used to estimate the fixed effects of treatment and time by means of the generalized least squares method [11]. The general Objective of this study was Gaussian longitudinal analysis of progression of Diabetes mellitus Patients using fasting blood sugar level following insulin and metformin follow up and identify associated factors of fasting blood sugar level in Debre Berhan referral hospital, Ethiopia.

Statement of the problem

Diabetes is a chronic health problem with devastating, yet preventable consequences. It is characterized by high blood glucose levels resulting from defects in insulin production, insulin action, or both. Along with the increase in incidence of diabetes, both individual and societal expectations concerning the management of diabetes have also increased. How fasting blood sugar level count involve over time after patients initiated to insulin and metformin or do a change has different pattern depending on the patients age, gender, weight, marital status, educational level, functional status ,occupation of patient, BMI of the patient, clinical diagnosis of insulin. Temesgen, *et al*.,(2014) studied the prevalence of chronic kidney disease and associated risk factors among diabetic patients in Southern Ethiopia using logistic regression by ignoring follow up time of fasting glucose level. But in most cases, factors influencing the progression of fasting blood sugar level were not well identified. Classical statistical models are not appropriate for longitudinal count data in the fasting blood sugar level are not expected to be independent within a patient over time. Hence, this study to investigate the problem stated above by using Logistic regression withbinary outcome for modelling the progression of fasting blood sugar level and to identify associated risk factors over time taking the correlation of fasting blood sugar level within a patient into account.

Objectives of the study

General Objective

To find the factors which are affecting the patients with respect to clinical diagnosis of insulin

Specific Objectives

To identify the factors which are significantly affect the patients based on the clinical diagnosis of insulin . To find the association between demographic variables against factors affecting the patients based on clinical diagnosis

Hypothesis of the study

General Hypothesis

H0: There is no association between factors (explanatory variables) and clinical diagnosis of insulin

H1: There is association between factors (explanatory variables) and clinical diagnosis of insulin

Specific Hypothesis

H01: There is no association between age of the respondents and clinical diagnosis

H02: There is no association between age and sex of the respondents (patients)

H03: There is no association between age and BMI

Significance of the study

This study helps to identify the major factors that affect Diabetes Mellitus patients based on the clinical diagnosis

Scope of the study

This study focused on the descriptive and explanatory analysis of the factors that affects Diabetes Mellitus patients based on the clinical diagnosis in Debra Berhan city Referral hospital.

II. Data and Methodology

Data: All Diabetes mellitus patients who were both Type I and Type II, and placed under insulin and Metformin follow up the case unit of 1st September, 2012- 30th August, 2015 G.C. To categorized fasting blood sugar level, that means under normal condition and below normal condition which was used to assess whether good control of fasting blood sugar level over time in Debra Berhan referral hospital for a period of three years. The total

number of patients included in this study was 248 of whom 111(44.8%) were females and the rest 137(55.2%) were males.

Methodology: The data set was a longitudinal observational study and the data also unbalanced, since some patients do not have data until the end of the study. But in this case the response variables are categorized; approaches were proposed to tackle this problem by using Logistic regression.

Study variables

Dependent variables

Clinical Diagnosis (Code: Type I DM =0, and Type II DM =1)

Independent variables

Age, Sex, Weight, Marital status, Education, occupation and BMI

Coding for the variables

Table-1.1(a)

Age	Less than 15	15-30	30-45	45-60	>60
Code	1	2	3	4	5

Table-1.1(b)

Sex	Code	Marital status	code	Occupation	code	Clinical Diagnosis	code
Male	0	Married	0	Full time	1	Type I DM	0
Female	1	Unmarried	1	Part time	2	Type II DM	1

Table-1.1(c)

Educational Status	Illiterate	primary	secondary	Higher
Code	1	2	3	4

The data of this study sample, population which would be obtained from Debre Berhan Referral Hospital at Debre Berhan, Ethiopia, patients records. The study variables for marital status of the patients are included only married and single, but the others include: Divorced, widowed not included in this study and the functional status of patients there is no bedridden diabetic patients.

The analysis based on descriptive and inferential statistics. After data is obtained, each variable was checked for completeness edited, cleaned missed values and the analysis performed with the help of SPSS and RStudio programing to provide frequencies and percentages for categorical variables and means and standard deviations for numerical variables and Logistic analysis

Analysis of data and discussion

Descriptive statistics

In this study the sample size has taken as respondents (Patients) of 248 and the analysis made on this sample with their demographic variables. The discussion made on their demographic variables of the patients.

Table -2.1 Frequency of Age of the Respondents

Age	Less than 15	15-30	30-45	45-60	>60
Number of Respondents	69	49	50	58	22
Per cent	27.8	19.8	20.2	23.4	8.9

From the Table-2.1, the demographic variable ages were discussed. The variable Age ranges from less than 15 to 60 and above, it is observed that among the age group, the age less than 15 has maximum respondent of 69 respondents out of 248 with a 30 per cent belongs to this category and in the case of 60 and above it is about 9 per cent of 22 respondents out of 248 were found. The rest of the ages are have the in between value. This is shown in the diagram as Figure-1

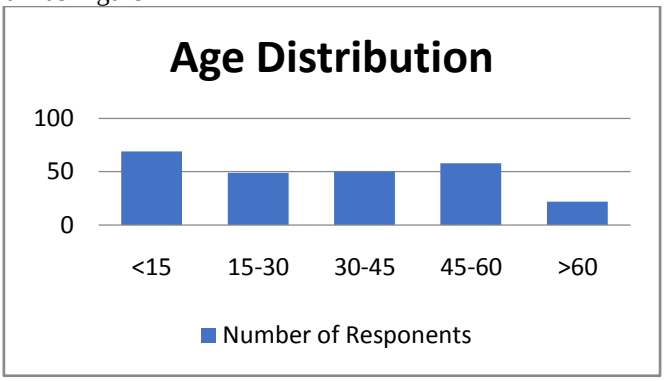

Figure 1: Age distribution

Table-2.2 Frequency of Sex of the Respondents

Sex	Number of Respondents	Per cent
Male	137	55.2
Female	111	44.8
Total	248	100.0

In Table-2.2, it was presented about the sex of the respondent as gender classification involved in this study. That is out of 248 respondents 137 were male that is more than 50 per cent of the respondents belongs to male and the rest of 111 respondent were female that of nearby 45 %. Further it was observed that out of 248 respondent's male has maximum involved compare to female. Below Figure -2 shows the gender involved in this study.

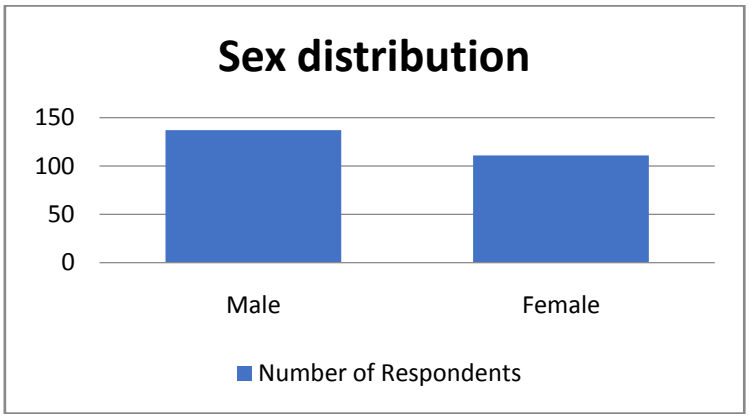

Figure 2: Sex distribution

Table-2.3: Frequency of Marital Status of the Respondents

Marital status	Married	Unmarried	Total
Number of respondents	194	54	248
Per cent	78.2	21.8	100.0

In Table – 2.3, it shows that it was involved with the respondents with respect to their marital status. There were two classification made as "Married and Unmarried". It shows that out 248 respondents nearly 78 per cent were classified as married, as unmarried around 22 per cent were marital status of respondents. Further by observation it was evident that the respondents were involved more comparatively with married in Clinical diagnosis. The Figure – 3 shows the marital status of respondents involved in Clinical diagnosis

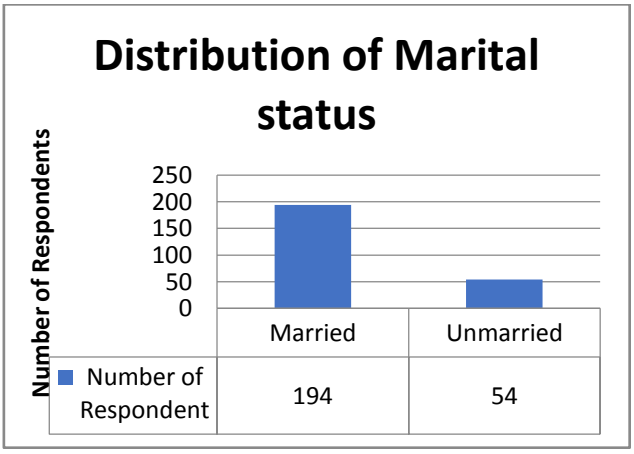

Figure 3: Distribution of Marital status

Table -2.4: Frequency of Functional status of the Respondents

Functional status	Working	Ambulatory	Total
Number of respondents	236	12	248
Per cent	95.2	4.8	100.0

In Table – 2.4, it shows that it was involved with the respondents with respect to their Functional status of DM patients. There were two classification made as "Working and Ambulatory". It shows that out 248 respondents nearly 95 per cent were classified as Working, as in the category of Ambulatory about 5 per cent were marital status of respondents. Further by observation it was evident that the respondents were involved more comparatively with Working status in Clinical diagnosis. The Figure – 4 shows the Functional status of respondents involved in Clinical diagnosis

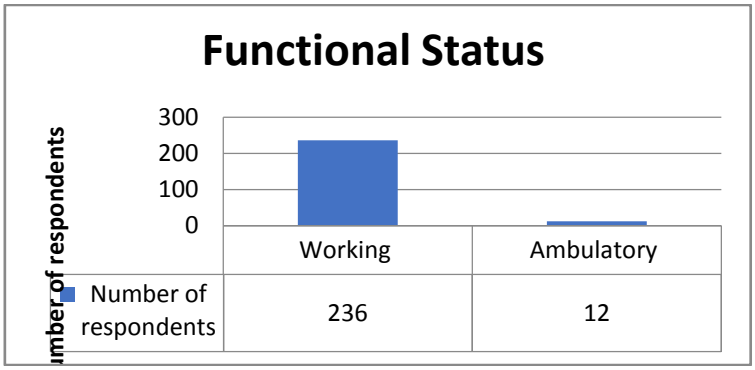

Figure 4: Distribution of Functional status

3. Cross tabulation

Cross tabulation analysis were used to study more than one variable involvement it has two or multidimensional presentation. Here the cross tabulation made and tested by using chi-square test for association of attributes with their respective degree of freedom and Inference made at 5 % level of significance.

Table -3.1:Cross Tabulation for Age of respondents with respect to Sex, Marital status, functional status and Educational status of the respondents

Age	**Sex**		**Total**	**Chi-square**	**p- value**	**Inference**
	Male	Female				
Less than15	38	31	69	2.224, 4 df	0.695	Accept H0 at 5%
15-30	27	22	49			
30-45	30	20	50			
45-60	28	30	58			
60+	14	8	22			
Total	137	111	248			
Age	**Marital status**		**Total**			
	Married	**Unmarried**				
Less than15	51	18	69	68.099, 4df	0.001	Reject Ho at 5%
15-30	19	30	49			
30-45	47	3	50			
45-60	56	2	58			
60+	21	1	22			
Total	**194**	**54**	248			
Age	**Functional status**		**Total**			
	Functional	**Ambulatory**				
Less than15	67	2	69	18.471, 4df	0.001	Reject Ho at 5%
15-30	47	2	49			
30-45	50	0	50			
45-60	55	3	58			
60+	17	5	22			
Total	236	12	248			

Age	**Educational status**						
	Illiterate	**primary**	**secondary**	**Higher**	**Total**	Chi Square and P-value	
Less than15	23	19	10	17	69	17.541,12df, P=0.130	Not to Reject Ho at 5%
15-30	14	13	13	9	49		
30-45	23	11	6	10	50		
45-60	17	14	14	13	58		
60+	10	10	1	1	22		
Total	87	67	44	50	248		

From the Table -3.1 the respondent's Age's associated with the other demographic variables such as sex marital status, functional status and Educational status of the respondents. From sex variable the chi-square test shows there is no significant difference between age with respect to sex of the respondents at 5% level of

significance. As we observe age with marital status, there was a significant association existed by the test using chi – square test, it is evident that to reject the Null hypothesis, it means that there was association between age and the marital status of respondents. Again an analysis performed with the variable age with functional status, test based on chi – square with a Null hypothesis of there is an association between Functional status and age of the respondents at 5% level and it gives a critical value at 18.471, 4df (p=0.001). Hence it is evident to Reject the null hypothesis. Finally in the table, the test of association of attributes for age and Educational status, the chi-square value is 17.541,12 df, p value is 0.130, leads to evident to accept the Null hypothesis at 5% level.

Table -3.2: Cross Tabulation for Sex of respondents with respect to Marital status, functional status Educational status and Occupational status of the respondents

Sex	**Marital status**				**Total**	**Chi-square**	**p- value**	**Inference**
	Married		**Unmarried**					
Male	101		36		137	3.644, 1 df	0.056	Reject H0 at 5%
Female	93		18		111			
Total	194		54		248			
Sex	**Functional Status**							
	Working		**Ambulatory**					
Male	133		4		137	2.448, 1 df	0.118	Accept H0 at 5%
Female	103		8		111			
Total	236		12		248			
Sex	**Educational status**							
	illiterate	**primary**	**secondary**	**Higher**				
Male	35	36	24	42	137	24.725, 3df	0.000	Reject H0 at 5%
Female	52	31	20	8	111			
Total	87	67	44	50	248			
Sex	**Occupational status**							
	Full time		**Part time**					
Male	104		33		137	52.894, 1df	0.000	Reject H0 at 5%
Female	33		78		111			
Total	137		111		248			

From the Table- 3.2 the respondent's Sex associated with the other demographic variables such as marital status, functional status Educational and Occupational status of the respondents. From sex with respect to marital status variable the chi-square test shows there is significant difference between sex with respect to marital status of the respondents at 5% level of significance. As we observe sex with Functional status, there was no significant association existed by the test using chi – square test, it is evident that to accept the Null hypothesis, it means that there was no association between sex with functional status of respondents. Again, an analysis performed in the table, sex with educational status, the chi-square value is 24.725, 3df, p value is 0.000, leads to evident to reject the Null hypothesis at 5% level. Finally, with the variable sex with occupational status, test based on chi – square with a Null hypothesis of there is no association between sex and occupational status of the respondents at 5% level and it gives a critical value at 52.894,1df (p=0.001). Hence it is evident to reject the null hypothesis.

Table -3.3: Cross Tabulation for Age, sex and marital status of respondents with respect to Clinical diagnosis of insulin of the respondents

Age	**Clinical diagnosis of insulin**		**Total**	**Chi-square**	**p- value**	**Inference**
	Type I	Type II				
Less than15	51	18	69	15.884, 4 df	0.003	Reject H0 at 5%
15-30	39	10	49			
30-45	27	23	50			
45-60	30	28	58			
60+	11	11	22			
Total	158	90	248			
Sex						
Male	98	39	137	8.102, 1 df	0.005	Reject H0 at 5%
Female	60	51	111			
Total	158	90	248			
Marital status						
Married	115	79	194	7.567, 1 df	0.006	Reject H0 at 5%
Unmarried	43	11	54			
Total	158	90	248			

From the Table -3.3, the respondent's age, sex and marital status associated with the clinical diagnosis status of the respondents. From age, sex and marital status with respect to with the clinical diagnosis status of the respondents, the chi-square test shows there is no significant difference between age, sex and marital status

with respect to with the clinical diagnosis status of the respondents at 5% level ofsignificance: Hence it is evident to reject the null hypothesis for the respondent's age, sex and marital status associated with the clinical diagnosis status of the respondents.

III. Logistic Regression

Logistic regression is used to predict a categorical (usually dichotomous) variable from asset of predictor variables. With a categorical dependent variable, discriminate function analysis is usually employ edit fall of the predictors are continuous and nicely distributed; logistic analysis is usually employed if all of the predictors are categorical; and logistic regression is often chosen if the predictor variables are a mix of continuous and categorical variables and/or if they are not nicely distributed (logistic regression makes no assumptions about the distributions of the predictor variables). Logistic regression has been especially popular with medical research in which the dependent variables whether or not a patient has a disease. In current study, there are 248 subjects considered, performing logistic regression has been devised as a Bivariate (Dichotomous) model using Logistic regression model. There is no Missing cases hence all 248 subjects were taken for this study from their Baseline data, observed from the Hospital record. Here the dichotomous variable considered based on the clinical status as a dependent (predictor) variable. The coded information presented below In logistic regression, the first step is to check that all cells in the model are populated, this is because any categorical variables in the design will skip this step. The logistic regression is a robust against multivariate normality and it is better suited for samples than a profit model when the samples are small.

Table 4.1: Case processing Summary

Un weighted cases		Cases(N)	Per cent
Selected cases	Including in Analysis	248	100.0
	Missing cases	0	.0
	Total	248	100.0
Unselected cases	Unselected cases	0	.0
	Total	248	100.0

Note: if weight is in effect, see classification table for the total number of cases

From Table- 4.1, case processing summary gives the selected and unselected cases of Unweight cases involved in the study. It is clearly displayed that the selected cases in this analysis including all 248 patients were included and there was no missing cases involved. That is all the patients were included in this study with 100 per cent of involvement. Also there were no unselected cases of 248 patients.

Table 4.2 : Dependent variable Encoding

Original value	**Internal value**
Type I DM	**0**
Type II DM	**1**

From Table- 4.2, the dependent variable clinical diagnosis of insulin were classified into two categories (Bivariate) as Type I DM and Type II DM with the internal value as 0 and 1 respectively.
The Logistic regression analysis is performed in an Iterative method

Block 0:

Table 4.3: Beginning Block (Classification Table[a,b])

Step 0 (Observed)		**Clinical Diagnosis (Predicted)**		**Percentage correct**
		Type I DM	**Type II DM**	
Clinical Diagnosis	Type I DM	**158**	**0**	**100.0**
	Type II DM	**90**	**0**	**0**
Over all Percentage				63.7

Note: constant is included in the model, b. The cut value is 0.50
In Table- 4.3, in BLOCK 0 outputs for this model, that includes only the intercept. For the two base status of dependent variable options (158/248 = 0.63) 63%, classified as Type I DM and 37% are categorized in Type II DM. As the best option is to predict for every case, that the subjects will decide to Type I DM, it is possible to say that 37% respondents were in Type II DM.

Table 4.4: Table Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.563	.132	18.161	1	.000	.570

The Table -4.4, shows table variables in the equation, gives the intercept model is ln (odds) is -0.563. If the coefficient exponentiation both sides on this expression, the predicted odds [Exp(B)] is 0.570. That is, the predicted odds based on Type II DM is 0.570. Since 90 of the patients decided to be on Type II DM and 158 decided to be in Type I DM and hence our observed odds are 90/158=0.57

The next iteration involves with Block 1 output of Block 1 showed in Table-4.5 the results after the addition of the explanatory variables selected. In Omnibus of model coefficients gives the chi-square of 250.524 on 7df, significant beyond the p –value of 0.000, this test with the null hypothesis of that adding the variables to the model has not significantly increased our ability to predict the decisions made by the respondents under our study. In the Omnibus tests of model coefficients table give the result of the likelihood ratio (LR)- test which indicated the inclusion of this Block of variables contributes significantly to model fit. A P-value of less than 0.05 for the Block means that the Block 1 model is a significant improvement to the Block O model.

Block 1:

Table- 4.5 Block 1: Method = Enter(Omnibus Test of Model Coefficients)

Step 1	Chi-Square	df	Sig.
Step	250.524	7	0.00
Block	250.524	7	0.00
Model	250.524	7	0.00

Under model summary in Table -4.6, we see that the -2 log. Likelihood statistic 74.391. This statistic gives as the best model predicts the decisions. Adding the value reduced the -2 log. Likelihood statistic by 326.33 and74.391 = 251.939. In the chi-square statistic in Omnibus tests of model: Regarding R square we have $2R^2$ Cox and Snell and Nagellerke values are presented to estimate the fit of the model to the data both are transformation so fit the -2log likelihood values. It gives the same R square in a multiple regression. In Cox and Snell R square it cannot reach as maximum value of 1 and the Nagellerke values R square can reach a maximum value of 1. In standard regression, the coefficient of determination is R square value gives an indication of how much variation in predicted variable is explained by the model. This cannot be calculated for logistic regression; the above R square try to measure something similar. From the above, we may conclude that between 36.8% and 45.1% of the variation in decisions can be explained by the model in Block1.

Table 4.6: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	74.391[a]	.368	.451

Note:Estimation terminated at iteration 8 because parameter estimates changed by less than 0.001

Table 4.7: Hosmer and Lemeshow Test (H-L Test)

Step	Chi-square	Df	Sig.
1	109.946	8	0.00

In table 4.7, The Hosmer and Lemeshow Test (H-L Test) performed with the hypothesis that the predictors made by the model fit perfectly with observed group memberships. A non -significant chi-square indicates that the data fit the model well, since the chi square shows 109.946 with 8 df and it is non-significant. Hence the model fitted well for the data in this study. That is the predictors made by the model fit perfectly with observed group memberships.

In Table- 4.8, the contingency table for H-L test presented. The cases are arranged in order by their predicted probability on the criterion variables. Usually the order cases are ten groups of equal or near size ordered of these groups, then the predicted group memberships and actual group memberships obtained with a 2X10 contingency table. A chi-square statistic is computed the observed frequency with those expected frequencies under the linear model.

Table 4.8: The contingency table for H-L test

Step1	Clinical Diagnosis				Total
	Type I DM		Type II DM		
	Observed	Expected	Observed	Expected	
1	25	24.999	0	.001	25
2	24	24.989	1	.011	25
3	25	24.950	0	.050	25
4	23	24.740	2	.260	25
5	25	24.256	0	.744	25
6	25	21.389	0	3.611	25
7	10	10.682	15	14.318	25
8	1	1.861	24	23.139	25
9	0	.132	25	24.868	25
10	0	.002	23	22.998	23

Table 4.9: Classification Table [a]

Step 1 (Observed)		Clinical Diagnosis (Predicted)		Percentage correct
		Type I DM	Type II DM	
Clinical Diagnosis	Type I DM	157	1	99.4
	Type II DM	3	87	96.7
Over all Percentage				98.4

Note: a The cut value is 0.50

Table- 4.9 shows the classification table about the clinical diagnosis, this rule allows us to correctly classify 87/90= 96.7% of the subjects where the predicted event of Type II DM was observed. This is known as the sensitivity of the prediction of the percentage of occurrences correctly predicted. In the same way, this rule allows us to correctly classify 157/158 = 99.4% of the subjects where the predicated event was not observed. This Specificity of prediction, the percentage of non-occurrences correctly predicted. Overall our predictors were correct for an overall success rate of 98.4 per cent (will be calculated from 244/248=98.4%). It was 63.7% for the model with intercept

Table 4.10: Variables in the Equation

Step 1[a]	B	S.E.	Wald	df	Sig.	Exp(B)
Age	-.028	.210	.017	1	.895	.973
sex	.936	.765	1.498	1	.221	2.550
weight	-.005	.062	.006	1	.937	.995
Marital	1.080	.879	1.511	1	.219	2.945
Edu	.115	.316	.132	1	.717	1.122
Occu	.141	.353	.159	1	.690	1.151
Bmi	1.888	.323	34.125	1	.000*	6.608
Constant	-46.886	7.459	39.515	1	.000*	.000

Note: Variable(s) entered on step 1: Age1, sex, weight, Marital, Edu, Occu, Bmi.
Values are statistically significant at *P< 0.05

From Table- 4.10, the discussion made on variables in the equation, in this table there is a check on coefficients with Standard error and Wald tests statistics with respective degree of freedom and exponential of coefficients. By Wald test statistic, tests the unique contribution of each predictor, in the context of other predictors as a constant. That is eliminating any overlap between predictors. From the table it is noticed that each predictormeet a conventional 0.05 standard for statistical significance, expect the constant and BMI (Body Mass Index). Also, the Wald test has a lacking adequate power. An alternative to this test of significance of each predictor by eliminating it from the full model and testing the significance of the increase in the -2Log likelihood statistic for the reduced model. The next step in the process of explaining table 4.10 is to interpret the odds ratios.

The model for the study is as the regression function of -46.886 -0.028(Age)+0.936(Sex)-0.005(weight) +1.080(marital)+0.115(Edu)+0.141(Occu)+1.888(Bmi). The table shows that the test of significance for each of the coefficients in the logistic regression model. By notice the constant and coefficient of Bmi are statistically significant at 5% level the rest of the other involved variables are insignificant. Basically, in Wald test statistic is t which is chi-square distributed with degree of freedom as 1. Further we can construct a logistic regression to improve by involving only the significant coefficient because of the scope of this study, not moved further.

IV. Results

In this study by using logistic regression model , we analysis seven variables as independent and the clinical diagnosis as a dependent variable for 248 subjects observed from the records available in Debre Berhan referral hospital for the DM patients . Among the involved seven variables only the variable Bmi show a significant difference and this variable influence the DM patients on their diagnosis status. By using R square analysis it was observes that it will lie between 63.6% and 87.1% of the variation in decisions can be explained by the model in Block1. Also the regression function of the study variables obtained as
-46.886-0.028(Age)+0.936(Sex)-0.005(weight) +1.080(marital)+0.115(Edu)+0.141(Occu)+1.888(Bmi).

V. Conclusion

This analysis of study was based on Logistic regression model, with a sample of 248 subjects from Debre Berhan referral hospital. This study is assisting in generating hypothesis for research on the possible causes of diagnosis of DM patients in Debre Berhan town. The following points were concluded on the basis of the study;

- There is no association between age with sex and educational status
- There is no association between sex with marital status, educational status and occupational status
- Based on Clinical diagnosis, there is an association existed for age, sex and marital status of the subjects
- These studies show an association between age with marital status

The study shows a high prevalence of Diagnosis due to Body mass index. With respect age both extremes are more respondents. In other studies, the history of disease and diets(Fasting system) also interest on diagnosis of DM patients. To reduce the patients and increase their quality of life to prolong their living time there must be some new innovative aids to be supplied to the society and by using current trends multimedia and social networks might involve to given awareness for the infected DM patient for their betterment life.

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